WASHINGTON
SCIENCE TRENDS

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* PROJECT AEROS

The first launching of an Aeros weather observation satellite is scheduled for sometime in 1964, according to M. Tepper, Chief, Meteorological Satellite Program, National Aeronautics and Space Administration. Following this initial effort, four more of the Aeros series will be launched at six to nine month intervals.

✓ "Stationary" Satellite -- Aeros is planned as a follow-on to the Tiros and Nimbus weather satellites. As these satellites rotate around the earth they view different portions of the earth during their transit. Thus, the evolution of a weather system can be followed only as a result of successive passages of the satellite over the same area -- and this may be a matter of several hours. Dr. Tepper states:

"The meteorologist is interested in a capability of continuously observing the developments of a particular storm area. This is particularly true of short-lived and severe storms where the entire life history may be only a matter of a few hours. It is also important to be able to follow the development of nascent storms before they explode into full maturity. The development of the Aeros family of satellites is for the purpose of satisfying this requirement.

"The Aeros satellites will be launched into a 'stationary' orbit of 22,300 miles around the earth. Thus, they will remain more or less overhead over a specific geographic area. Being in equatorial orbit, they will view events essentially in the tropical and temperate latitudes, but not in the polar regions."

✓ Instrumentation Requirements -- The principal instrumentation to be developed for the Aeros project would be a cloud cover observational system with TV cameras having a variable focus in order to view in greater detail the particular storm area chosen for observation. A Zoomar type camera development program is included in the NASA program now pending in Congress.

✓ "Stationkeeping" -- The Aeros satellites will be earth-stabilized, with a spacecraft configuration similar to that now under advanced development for the Nimbus series. A problem still to be solved is that of "stationkeeping" -- correcting the orbit to keep the satellite stationary relative to the earth to compensate for perturbations introduced by the moon and other factors.

✓ Status -- The Aeros concept and plan is yet to be officially approved and funded. However, the "popularity" of the weather satellite program indicates that approval will be forthcoming in time for the scheduled 1964 launching, which will employ a Centaur booster.

* PURE FLUID AMPLIFICATION: Two chapters of the long-awaited handbook on design of "intelligent" fluid operating systems which require no moving parts may now be ordered (at 25 cents each) as Fluid Amplifier Handbook, Chapters 1 & 7, from OTS, U. S. Department of Commerce, Washington 25, D. C.

NEW RESEARCH FACILITIES

* ATOMIC PHYSICS DATA CENTER

The National Bureau of Standards has established a new data center for the collection and evaluation of data on atomic transition probabilities and cross-sections for current and future research in plasma physics and astrophysics.

The new Center is now prepared to supply, on a limited basis, bibliographies of publications on transition probabilities of particular elements, as well as certain related material. Plans call for expansion of such services.

(For further information, or to cooperate in Center programs by submitting preprints and reprints of pertinent publications, write: The Atomic Physics Data Center, Far West Building, National Bureau of Standards, Washington 25, D. C.)

* HIGH TEMPERATURE FACILITY

A variety of applications are planned for a new high temperature facility developed under Government sponsorship. The unit can test missile nose cone materials and other temperature resistant compounds under conditions simulating rocket entry into the atmospheres of the Earth, Venus, Mars or Saturn. The same unit can be used, it is reported, to study the effects of heating on vehicles in the vacuum of space or materials under the high temperatures which might result from a nuclear accident. The facility is capable of generating temperatures approaching those of the Sun's surface (9,800°F.); pressures ranging from 0.1mm Hg to 9 atmospheres applied on the material undergoing test, and any non-toxic-gas as an atmosphere. With modifications, variety of programs could be conducted such as high thermal flux combined with ionizing radiation, varied chemical environments, etc.

(Facility developed by Southwest Research Institute, 8500 Culebra Rd., San Antonio 6, Texas, under sponsorship of the National Aeronautics and Space Administration)

* SOLAR TELESCOPE

A 380 foot tunnel is being cored into the top of Kitt Peak, a mountain 40 miles southwest of Tucson, Arizona for use in connection with a $4 million solar telescope program, expected to be completed by 1962.

The tunnel, 15 feet in diameter, is being excavated at an angle of approximately 32 degrees. Rising nearby is a large steel and concrete pillar to support a motor driven flat mirror or heliostat. Standing 110 feet above the ground, the heliostat will track the sun and reflect an image of it down an angled shaft extending from the top of the pillar to the bottom of the tunnel, a total distance of almost 500 feet. From that point the solar image will be reflected 280 feet to a third mirror which will project it to an underground observing room. There the image, as large as 34 inches in diameter, may be photographed or directed to spectroscopes. The facility will be available to all qualified scientists for research purposes.

* LOW-LEVEL RADIOACTIVITY LABORATORY

The National Bureau of Standards has established a new facility for measurement of very low levels of radioactivity, including studies of the radioactive contamination of reagent chemicals and materials used in radiation detection.

Bureau officials report work is now in progress involving such radionuclides as natural uranium, radiu-226, thorium-230 and strontium-yttrium-90. Those to be investigated at the earliest opportunity include sulfur-35, cobalt-60, ruthenium-106 and cesium-barium-137.

(Activity directed by W. F. Marlow and L. L. Stockman, National Bureau of Standards, Washington 25, D. C.)

TECHNICAL TRENDS

□ General Services Administration is asking for proposals to convert stockpiled molybdenite to the higher use forms of molybdic oxide and ferromolybdenum. For details write Defense Materials Service, Room 6018, 18th and F Sts., N. W., Washington, D. C. √√√ Details of the Maritime Administration's hydrofoil program are outlined in Release MA SP 61-12 from Information Office, U. S. Maritime Administration, Washington 25, D. C. √√√ Detailed statistical information on an estimated $120 million in electrical measuring instrument shipments by U. S. manufacturers in 1960 is contained in Report BD 61-72, Electrical Measuring Instrument Shipments, issued by Scientific, Motion Picture and Photographic Products Division, Business and Defense Services Administration, U. S. Department of Commerce, Washington 25, D. C.

□ The Navy has accepted delivery of its first helicopter flight and weapon system simulator trainers designed and built by Melpar, Inc., Falls Church, Va. The trainer duplicates the full performance range of Sikorsky's new HSS-2 antisubmarine helicopter. √√√ The Internal Revenue Service has decided, with reservations, not to appeal the case of an aircraft worker who was transferred by his employer to Edwards Air Force Base, Calif. and deducted "away from home" expenses for more than a year's food and lodging. For details, ask Public Information Office, U. S. Internal Revenue Service, Washington 25, D. C. for Technical Information Release No. 314. √√√ The Publications Section, U. S. Weather Bureau, Washington 25, D. C. has available a full description of a unique "slide rule" for computing evapotranspiration and keeping track of changes in soil moisture.

□ Selected scientists and engineers of the military services and other government agencies will discuss propellant actuated devices at a technical symposium May 17-19. Developers and users are being asked to provide exhibits of PAD devices, equipment systems and future concepts. For details, contact W. H. Simmons, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, Pa. √√√ The Army has now announced that the "Servo-Solider" Concept of power-operated mechanical suits stems from a proposal submitted by the Cornell Aeronautical Laboratory. For details see SCIENCE TRENDS, March 3, 1961. √√√ The Atomic Energy Commission will conduct an unclassified symposium on Sodium Reactor Technology at Lincoln, Nebraska on May 24-25, 1961. Details are available from Mr. Charles Sayre, Consumers Public Power District, 1401 "O" Street, Lincoln, Neb. √√√ The Department of Commerce, Electrical Equipment Division, Washington 25, D. C. has found increasing use abroad of the so-called Edison screw and parallel blade attachment plug, which is standard equipment for electric wiring installations in the U. S. and Canada. √√√ The Atomic Energy Commission has set aside industrial protests and will adhere to its original regulations (SCIENCE TRENDS, Dec. 14, 1960) for permitting private participation in classified areas of the Gas Centrifuge field.

□ The Navy is interested in establishing an outside source for prototype manufacture of gas gain photoionization chambers for use in sounding rocket ultraviolet studies. The chamber is a gas-filled diode with a lithium fluoride window. Complete details will be available at a briefing April 28, 1961. Interested organizations should contact W. Kreplin, Mail Code 7125, U. S. Naval Research Laboratory, Washington 25, D. C. by April 26. √√√ Applications are now being accepted for courses in reactor operations supervision and reactor hazards evaluation which begin September 25, 1961 at Oak Ridge National Laboratory. Tuition is $2,000. The programs are designed principally for students from abroad but U. S. citizens are eligible and may apply to the Director, Division of International Affairs, U. S. Atomic Energy Commission, Washington 25, D. C. by June 15, 1961.

RESEARCH CHECKLIST

- MICROELECTRONIC CONNECTORS: The Army is sponsoring studies of the susceptibility of miniature electrical connectors to failure caused by contamination, a subject particularly troublesome in low-level circuits. Such failures have been caused by insulating deposits, organic vapors and even particles of floor wax. The studies confirm that if the physical loading force on the connector is increased to overcome the resistance caused by contamination, the connection still may fail from excessive wear caused by high friction of the mating parts. In an initial approach to the problem, investigators applied a surface treatment of stearic acid to reduce friction, while preserving low contact resistance.

  (R&D directed by J. R. Anderson, Physical Chemistry Section, Stanford Research Institute for U. S. Army Signal Research and Development Laboratory, Ft. Monmouth, N. J.)

- VAPOR-FREE PAINT: The Navy reports successful test of a newly developed acrylic latex coating which loses 95 percent of its dangerous fumes within 24 hours, releasing the remainder in harmless amounts. The new paints were tested aboard the submarine USS Triton in a search for means of reducing atmospheric contamination, one of the major factors limiting the submergence period of nuclear submarines. The acrylic latex dries in 20 minutes, and can be used in both bulkhead and deck applications.

  (R&D reported by D. E. Field, U. S. Naval Research Laboratory, Washington 25, D. C. to American Chemical Society, Division of Organic Coatings)

- NUCLEAR THERMOELECTRIC GENERATOR FOR LUNAR IMPACT: A 13 watt nuclear thermoelectric generator with no moving parts which will operate satisfactorily after a 340 mph "hard" landing on the moon has been designed by the Martin Co. for the Atomic Energy Commission at the request of NASA's Jet Propulsion Laboratory. Four sealed canisters of cerium-242 are the generator's heat source. They are located with two arrays of thermoelectric elements in a hard container which has its excess volume filled with solid shock absorbing, thermal-electric insulation. Excess nuclear heat is dumped out of the top of the unit through a large, bowl-shaped radiator. Landing system is a single shot metal bellows filled with gas. Impact energy is absorbed by gas compression and yielding of the bellows' walls. Preliminary studies indicate nuclear fuel would not be released if the payload's retrorocket failed to fire and impact velocity was close to 10,000 fps.

- HUMIDITY EFFECTS ON MICROBALANCES: Studies at the National Bureau of Standards indicate that changes in relative humidity may seriously alter the rest point of microchemical balances. They may be enough to cause important errors in chemical analysis. The studies show that careful design of balance components, selection of materials that absorb little moisture, and maximum cleanliness can minimize these difficulties.

  (For details, write National Bureau of Standards, Office of Technical Information, Washington 25, D. C. regarding "Humidity Effects on Microbalances"

- HIGH-TEMPERATURE, HIGH-STRENGTH CERAMIC FIBERS: Filaments of refractory glasses with tensile strengths as high as 138,000 psi at room temperature and 132,000 psi at 1500°F have been prepared by the Carborundum Co. under contract to the Air Force. The refractory glasses were in the baria-alumina-silica, and calcia-alumina-silica systems. The filaments of these silica and high-silica compositions were made by heating in refractory crucibles in an inert atmosphere and then drawing into a monofilament.

  (WADD Technical Report 60-244 available through military channels or at $2.25 from OTS, U. S. Department of Commerce, Washington 25, D. C.)

- ZERO-GRAVITY TRANSFER OF CYROGENIC FLUIDS: Expulsion bag techniques of forcing the movement of cyrogenic fluids under zero-gravity have been studied by the National Aeronautics and Space Administration with good success under limited test conditions. It is believed that the expulsion bag method will present fewer design problems than a piston-cylinder pump. Performance of the mylar coated dacron, expulsion bag material was especially encouraging even after repeated cycles.

  (Report available. Write National Aeronautics and Space Administration, ATTN: Code BID, 1520 H Street, N. W., Washington 25, D. C. regarding NASA Technical Note D-849)

- ULTRA-STRENGTH MATERIALS: Studies for the Navy are aimed at the development of ultra-strength composite materials expected to be three or four times stronger at white heat than any existing high-strength alloy, on a pound for pound basis. Preliminary work is aimed at combining minute "whiskers" of pure sapphire with aluminum to achieve a strength to weight ratio of 600,000 inches at 2000° F. Methods of combining the whiskers with a metal body, now being explored, include: impregnating molten metal with a pack of whiskers under a vacuum; mixing whiskers and powdered metal, and then heating the mix. Major problems in fabrication are the difficulty in achieving a "wetting" or bonding of the whiskers to the aluminum body, and a tendency for pores to appear.

  (R&D for the Bureau of Naval Weapons, Washington 25, D. C. reported by W. H. Sutton, Space Sciences Laboratory, Missile and Space Vehicle Department, General Electric Co., Philadelphia 4, Pa.)

- GAS FLOATED SPINNING SPHERES: Equations for the viscous drag and power requirements of gas-floated spheres spinning within a concentric hollow shell and within a multiple pad system have been developed at NASA's Jet Propulsion Laboratory. Spinning spherical masses are of interest in the design of improved stable gyro references and momentum-transfer devices for spacecraft attitude control and guidance.

- IMPROVED HELICOPTER EFFICIENCY: Recent helicopter research programs of the National Aeronautics and Space Administration show that considerable improvement can be made in the lifting power of flying cranes, in the top speed and range of passenger helicopters and in widely accepted theory of blade performance. The new information is an extension of well accepted techniques. Hovering efficiency of flying cranes was improved through the use of a modified NASA airfoil with considerable camber. Top speed and range of passenger helicopter designs can be increased through the use of narrow and deep fuselages, cleaned up rotor heads and retractable landing gear. Experiments have shown that accepted methods of calculating compressibility losses for hovering blades give results that are much too high.

  (Report available. Write National Aeronautics and Space Administration, ATTN: Code BID, 1520 H Street, N. W., Washington 25, D. C. regarding NASA Technical Note D-734)

- GAMMA RADIATION DETECTOR: The Los Alamos Scientific Laboratories have made public the details of system designed to detect and warn of any significant rise in the gamma radiation background level that occurs anywhere within specified areas of its plutonium processing plant. The system features a group of ionization chamber gamma radiation sensing elements and alarm horns interconnected through a single, remotely located control console.

  (For details, see Report LA 2490 available through AEC channels or at 50 cents from OTS, U. S. Department of Commerce, Washington 25, D. C.)

PUBLICATION CHECKLIST

- ☐ RESEARCH AND DEVELOPMENT IMPLICATIONS, a survey and abstracts of current projects in academic and other non-profit institutions concerned with the economic and social implications of scientific research and development. 119 Pages. (Write Office of Special Studies, National Science Foundation, Washington 25, D. C. regarding Publication NSF 60-79)

- ☐ FAA PATENT PRACTICES, an excellent review of the patent policies of this agency, which concerns itself with air safety and other aspects of aviation. Information of value to contractors interested in learning more about the patent aspects of Federal Aviation Agency research and development. 69 Pages. (Write Chairman, Subcommittee on Patents, Committee on the Judiciary, U. S. Senate, Washington 25, D. C. regarding Report on "Patent Practices of the FAA")

- ☐ UNCONVENTIONAL MACHINING METHODS, an interesting summary of background material on novel methods of machining, including electrical machining techniques, and chemical and ultrasonic methods. 20 Pages. Single copies free to Government Agencies, contractors, subcontractors and their suppliers. (Write Defense Metals Information Center, Battelle Memorial Institute, Columbus 1, Ohio regarding DMIC Memorandum No. 75)

- ☐ RECORD RETENTION GUIDE, the seventh edition of a standard handbook describing record retention regulations of various Government agencies. An index lists the categories of persons, companies and products affected. 15 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for "Guide to Record Retention Requirements")

- ☐ LUNAR TERMS, a glossary of selected Russian and English lunar terms, and a list of astronomical and astrophysical observatories. Also includes a list of astronomers in the USSR active in lunar research. 72 Pages. $1.75. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. regarding Publication 61-11163)

- ☐ SCIENCE AND THE FUTURE OF ARID LANDS, a pamphlet in popular style outlining the problems of desert areas and some of the solutions being advanced by science. 96 Pages. Single Copies Free. (Write Publications Office, UNESCO, Place de Fontenoy, Paris 7, France for "Science and the Future of Arid Lands")

- ☐ ECONOMICS OF FUSION REACTORS, an August, 1960 study now available. A technical study concerned with some aspects of the power balance and eventual economics of fusion reactors. 62 Pages. (Report UCRL 6077 available through AEC channels or at $1.50 from OTS, U. S. Department of Commerce, Washington 25, D. C.)

- ☐ COMPUTER PROGRAMS FOR CHEMICAL INFORMATION SEARCHING, a fine survey from the National Bureau of Standards of 12 major computer systems for searching chemical literature. Also discusses different chemical notation systems, indexing and abstracting procedures. Provides a number of references to further information. 84 Pages. $2.25. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for NBS Technical Note 85)

- ☐ GASFREEING OF CARGO TANKS, a study of the gas explosion hazards likely to be encountered in "gasfreeing" -- the removal of oil and vapors from tanks and other large vessels. 10 Pages. Single Copies Free. (Write Publication-Distribution Section, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Information Circular No. 7994)

- ☐ A GLOSSARY OF THE DIAMOND DRILLING INDUSTRY, provides descriptive information on the use of diamond-drilling techniques and processes in garnering physical data needed by mining, civil, petroleum and other professional engineering groups. 98 Pages. 35 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication No. I 28.3:583)